The fear gasping face as a threat display in a Melanesian society

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Theory and research show that humans attribute both emotions and intentions to others on the basis of facial behavior: A gasping face can be seen as showing "fear" and intent to submit. The assumption that such interpretations are pancultural derives largely from Western societies. Here, we report two studies conducted in an indigenous, small-scale Melanesian society with considerable cultural and visual isolation from the West: the Trobrianders of Papua New Guinea. Our multidisciplinary research team spoke the vernacular and had extensive prior fieldwork experience. In study 1, Trobriand adolescents were asked to attribute emotions, social motives, or both to a set of facial displays. Trobrianders showed a mixed and variable attribution pattern, although with much lower agreement than studies of Western samples. Remarkably, the gasping face (traditionally considered a display of fear and submission in the West) was consistently matched to two unpredicted categories: anger and threat. In study 2, adolescents were asked to select the face that was threatening; Trobrianders chose the "fear" gasping face whereas Spaniards chose an "angry" scowling face. Our findings, consistent with functional approaches to animal communication and observations made on threat displays in small-scale societies, challenge the Western assumption that "fear" gasping faces uniformly express fear or signal submission across cultures.

behavioral ecology | facial behavior | indigenous societies | emotion | diversity

Do facial movements communicate the same message to people of different societies? On the one hand, recent evidence from cognitive science shows that basic psychological processes previously assumed to be universal may be deeply affected by culture (1–4). On the other hand, common wisdom continues to assume that facial movements effectively communicate accurate messages that are decoded in the same way by recipients whatever their culture (5).

Even if we assume that facial movements express something, what they express and to whom remain controversial (6–8). Currently, scientists disagree on whether facial movements are indicants of basic emotions, social motives, or something else (9, 10). Basic emotions theorists claim that certain facial displays (i.e., "facial expressions of emotion") are readouts of basic emotions (11, 12). For example, a pouting face is predicted to be panculturally produced when feeling sadness and panculturally "recognized" by observers as an expression of sadness. On the contrary, behavioral ecologists argue that facial displays are context-dependent social tools aimed at influencing others in social interactions (13, 14). For example, a pouting "sad" face could, in common contexts, be interpreted by recipients as recruiting their protection and succor, and, for the producer, the display serves that recruitment motive regardless of any necessary underlying state (i.e., the pout may follow injury, serve to ingratiate, initiate flirtation, or be part of a con game) (15). Behavioral ecology emphasizes the role of the facial display in guiding social interaction and does not necessarily depend on reportable "recognition." Nonetheless, predictions from behavioral ecology on what social motive observers explicitly recognize provide an important contrast to predictions from the basic emotion perspective.

Although several studies have compared these two approaches from the producer's (16) and the recipient's (17–19) perspectives, these findings have been limited to Western industrialized societies. More informative tests on the extent of uniformity vs. diversity in human facial displays require studies in small-scale, indigenous societies (20). Here, we report two such studies, collected by a multidisciplinary research team, speaking the vernacular and with extensive field experience, using adolescents from a small-scale society—the Trobriand Islands of Papua New Guinea—with considerable cultural and visual isolation from the West.

Trobrianders are subsistence horticulturalists and fishermen living in the Trobriand Islands (Milne Bay Province, Papua New Guinea) (21, 22). The Trobriand Islands are a small archipelago of raised coral atolls located in the Solomon Sea ~200 km east of mainland Papua New Guinea. The Trobriand archipelago comprises ~500 islands, only 9 of which are inhabited (Kiriwina, Kaileuna, Kitava, Vakuta, Tuma, Kuyawa, Munwata, Konia, and Kawa) (Fig. 1). Trobrianders strongly preserve their ancient customs and beliefs, such as witchcraft and sorcery, techniques for tilling the soil, carving, rites, taboos, and vernacular (23, 24) (Fig. S1). Thus, Trobrianders are a relevant study population due to their relatively high degree of cultural and visual isolation from mainland Papua New Guinea and the industrialized West (*Supporting Information*).

In study 1, we tested whether Trobriand adolescents attribute emotions, social motives, or both to a set of facial displays. In study 2—a follow-up study based on study 1's unexpected results—we asked which facial behavior is selected specifically as a threat display by Trobrianders and by Spaniards.

Results and Discussion

Study 1: Attributions of Emotion and Social Motives. To test whether Trobriand adolescents attribute emotions, social motives, or both

Significance

Humans interpret others' facial behavior, such as frowns and smiles, and guide their behavior accordingly, but whether such interpretations are pancultural or culturally specific is unknown. In a society with a great degree of cultural and visual isolation from the West—Trobrianders of Papua New Guinea—adolescents interpreted a gasping face (seen by Western samples as conveying fear and submission) as conveying anger and threat. This finding is important not only in supporting behavioral ecology and the ethological approach to facial behavior, as well as challenging psychology's approach of allegedly pancultural "basic emotions," but also in applications such as emotional intelligence tests and border security.

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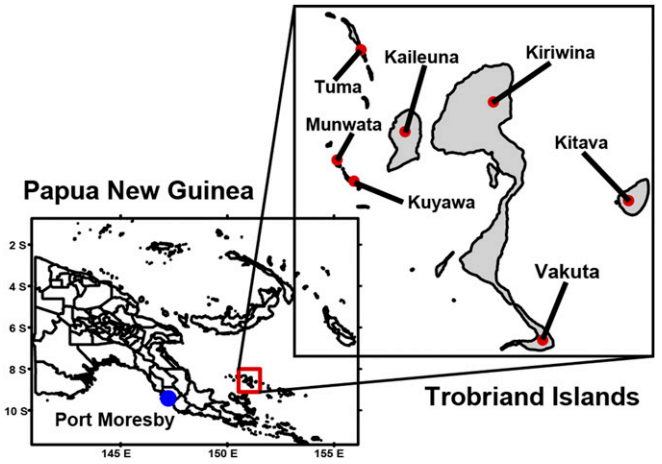

Fig. 1. Location of the Trobriand Islands (Milne Bay Province, Papua New Guinea). Red dots signal seven of the nine most inhabited islands of the archipelago, with Kiriwina Island the most populated (~60,000 Trobrianders) and Munwata the least (~250 Trobrianders). Study 1 (n = 72) was conducted with participants from Kaileuna, Munwata, and Kuyawa Islands. Study 2 (n = 58) was conducted in Kaileuna and Vakuta Islands.

to facial behavior, we asked observers to point to the facial expression of a person who, in the emotion condition, felt a specific emotion or, in the social motives condition, communicated a specific social motive (*Materials and Methods*).

Our results support previous findings that showed a mixed attribution of emotions and social motives to facial displays. For the emotion condition, we found that three out of five facial expressions were modal for the predicted emotion (happiness, sadness, and fear) whereas, for the social motives condition, we found two (social invitation and rejection). In the emotion condition, the proportion of participants who selected the predicted emotion ranged from extremely high (happiness = 1) through moderate (sadness = 0.53) and low (fear = 0.39; disgust = 0.22) to negligible (anger = 0.06). Similarly, for the social motives condition, the proportions ranged from high (social invitation = 0.67), moderate (rejection = 0.56), low (help, protection = 0.17), to extremely low (submission = 0.11; threat = 0.06) (Fig. 2).

We found a clear pattern of attribution only for happy and sad emotions (all χ^2s > 51.10, Ps < 0.001) and the social motive of rejection (χ^2 > 60.06, P < 0.001) (Table S1). These findings were supported by two-sample permutation tests on the predictions made for emotion and social motives' attributions (Table S2). On the one hand, Trobrianders relied significantly more frequently on emotion attributions rather than on social motives for smiling [P < 0.001, 95% confidence interval (CI) (0.17, 0.48)], pouting [P = 0.003, 95% CI (0.15, 0.57)], and gasping [P = 0.013, 95% CI (0.07, 0.47)] faces. On the other hand, for the nose-scrunching face, Trobrianders showed a preference for attributions of rejection instead of disgust [P = 0.007, 95% CI (−0.56, −0.12)]. On the original question this study was designed to answer, we found that both emotions and social motives were attributed to facial displays by Trobrianders, although in proportions noticeably lower than those found in Western societies.

The study also produced a surprising result. Unexpectedly, gasping faces were consistently mismatched in both the emotion and social motives conditions to the emotion label anger (0.56)—greater than the predicted label fear or the label disgust—and to the social motive of threat (0.69)—greater than the predicted social motive of submission [estimated difference of proportions = −0.14, P = 0.330, 95% CI (−0.37, 0.09)]. This finding was robust across gender (Cochran–Mantel–Haenszel test with 10,000 Monte-Carlo resamplings, χ^2 = 1.44, P = 0.329) and was also consistent with the extremely low proportion of Trobrianders who matched the scowling face to its predicted emotion (anger = 0.06) and social motive (threat = 0.06).

Study 2: Threat Displays in the Trobriand Islands and a Western Industrialized Society. That the "fear" gasping face is a signal of fear and submission is pervasively assumed in clinical and applied psychology (25–27). Moreover, the gasping face has been used widely in neuroscience to test hypotheses regarding fear and the amygdala (28, 29). Thus, study 2 aimed to replicate our unexpected results of study 1 on the "fear" gasping face. We tested whether the attribution of threat and aggression to the "fear" gasping face was robust across both changes in method and with a different sample of Trobriand participants. Specifically, in study 2, we (*i*) used an antecedent story task that avoids the problems inherent in one-to-one translations of Trobriand emotion terms into English (30), (*ii*) used a male poser, and (*iii*) used as foils those faces that had contributed to the confusions in matching the "fear" gasping face to an emotion label in study 1 (Table S1). Additionally, we performed comparisons between societies, by examining responses of Trobrianders vs. Spaniards, as well as within societies, by subsampling participants from two geographically distant islands of the Trobriand archipelago. In single trials, Trobrianders and Spaniards

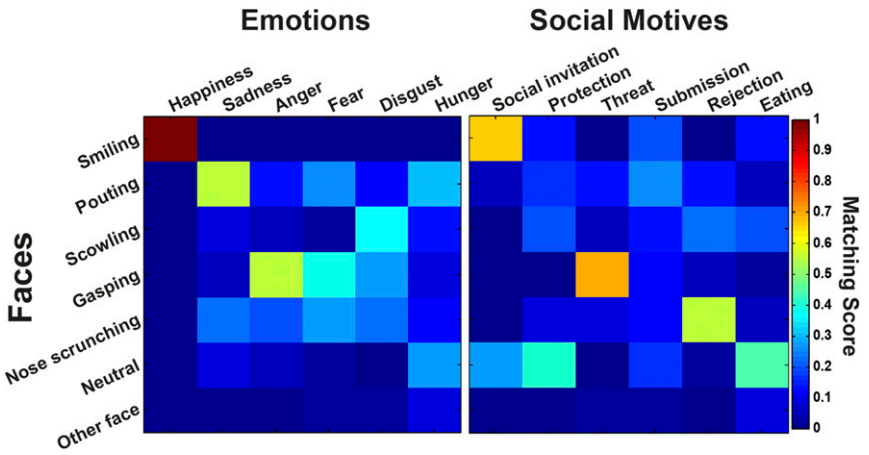

Fig. 2. Heat map showing matching scores' proportions between facial expressions and emotion (n = 36) or social motive (n = 36) attributions. The color coding indicates the magnitude of the matching score, ranging from 0 (dark blue) to 1 (dark red). Participants could select a face from an array of six facial expressions of "emotion," pick a card with a black cross meaning "other face not present in the array," or answer that they did not know the response.

were asked to select the threat display (i.e., the face that predicts an aggressor's physical attack) (Fig. 3*A*).

Trobrianders selected primarily the "fear" gasping face as the one predicting an aggression [right unilateral binomial test with chance level set at 0.25; 0.78, 95% CI (0.65, 0.87), $P < 0.001$]. The proportion of Trobrianders who selected the gasping face was significantly higher than the proportion who selected the scowling [0.16, 95% CI (0.08, 0.27)], nose scrunching [0.05, 95% CI (0.01, 0.15)], or neutral [0.02, 95% CI (0.00, 0.10)] faces (Fig. 3*B*). In contrast, Spaniards' modal facial expression for aggression was the "anger" scowling face [right unilateral binomial test with chance level set at 0.25; 0.47, 95% CI (0.34, 0.59), $P < 0.001$].

Trobrianders and Spaniards also differed on their modal threat displays. Trobrianders selected the "fear" gasping face much more than Spaniards [χ^2 (1) = 56.53, $P < 0.001$, 95% CI (0.56, 0.81)] whereas Spaniards preferred the "anger" scowling face [χ^2 (1) = 11.64, $P < 0.001$, 95% CI (−0.46, −0.15)]. Within the Trobrianders, both the Kaileuna [0.77, 95% CI (0.59, 0.89)] and the Vakuta [0.79, 95% CI (0.60, 0.90)] islanders selected the "fear" gasping face as their indicant of threat [χ^2 (1) = 0.24, $P = 0.625$, 95% CI (−0.13, 0.30)].

The cultural difference in modal threat display was robust across gender. In a binary logistic regression model with society (Trobrianders vs. Spaniards) and gender (female vs. male) as predictors of "fear" gasping faces, the additive model was significant [χ^2 (2) = 67.97, $P < 0.001$; Hosmer–Lemeshow test, χ^2 (2) = 0.40, $P = 0.818$] with society, not gender, as the predictor to retain in the model (Table S3). The odds of a Trobriander selecting the "fear" gasping face as a threat display was 48.70 times higher than the "fear" gasping face being selected by a Spaniard [Wald chi-square (W) = 39.92, $P < 0.001$, 95% CI (14.59, 162.54)]. Conversely, on applying the same binary logistic model to scowling faces [χ^2 (2) = 14.75, $P < 0.001$; Hosmer–Lemeshow test, χ^2 (2) = 0.46, $P = 0.793$], being a Spaniard increased the chances of selecting the "anger" scowling face as a threat display [$W = 12.16$, $P < 0.001$, odds ratio (OR) = 4.83, 95% CI (1.99, 11.69)], but gender did not (Table S4).

General Discussion. As expected, we found that members of a small-scale society attributed both emotions and social motives to facial displays that have been characterized as "emotion signals" by basic emotion theorists. They do so with less agreement, however, than found in Western societies (7). More telling was our unexpected finding on the "fear" gasping face and a threat display.

We found marked differences between the members of a small-scale Melanesian society and a Western industrialized society on what is a threat display. "Angry" scowling faces were the modal threat display for Spaniards whereas "fear" gasping faces were the modal threat display for Trobrianders. This difference emerged in emotion labeling, in selecting social motives, and in the story task in which contextual information was included in study 2 (31). Interestingly, even in the West, the "fear" gasping face was seen as a threat display when the displayer was in an anger-eliciting situation (32). It could also be argued that the proximity between the "fear" gasping and the "anger" scowling faces on a bidimensional space of valence and arousal—both unpleasant and highly activated displays—could facilitate the miscategorization (33). Alert responses in mammals range from sustained examination of the threatening stimulus (e.g., frowning) to scanning eye movements (e.g., wide open eyes) (34). Although some researchers propose that the upper-face movements in the "fear" gasping face were adaptations to enhance vision (35), others consider brow knitting and brow raising as homologous with protective earflap protraction and retraction in nonprimates (14, 36). The gasping face was also chosen, to a lesser extent, for fear and disgust emotion terms, but Trobrianders ascribed to the gasping face an intent to harm rather than to submit or reject (study 1), and they also selected the gasping face as a threat display in the antecedent story task (study 2). Thus, the association of the gasping face with fear and disgust was limited to emotion labels and therefore may have more to do with the breadth of Kilivila emotion labels rather than the meaning ascribed to the gasping face. This finding converges with results obtained using another recognition task (i.e., matching a facial expression from an array of faces to an emotion label in a between-subjects design) in other areas and islands of the Trobriand archipelago (37).

Although our different methods led to similar outcomes, it could be contended that using only a small set of Western Caucasian static stimuli underestimated Trobrianders' matching scores (38, 39). Indeed, finer descriptions as well as more robust methods (e.g., data-driven psychophysical approaches) are needed (40–42). Similarly, it might be argued that our sample of adolescents might underestimate the ability of adults to recognize fear rather than anger/threat in the gasping face. Still, evidence from children from another indigenous population of hunter-gatherers (the Fore of Papua New Guinea) has been taken to support the universality of emotion signals as predicted in basic emotion theory (30).

The use of "fear" gasping faces to signal threat and intent to harm has been observed systematically in agonistic encounters across various small-scale societies (43). The same threat display has been ritualized in the form of Maori's traditional male posture dances (e.g., *haka taparahi*, *peruperu*) (44, 45). In these dances, *puakana* (i.e., facial expression) is used to induce fear and submission in the audience. The facial displays that Maoris produce in this ceremonial dances are "fear" gasping faces plus tongue protrusion, a variation on the standard threat display that implies threatening mockery (43) and is used to decrease the likelihood of an interactive friendly approach in humans and nonhuman primate species (46, 47).

The "threatening stare" or "threat gaze"—observed among !Kung Bushmen, Yanomami, Himba, Eipo, Maori, and Balinese

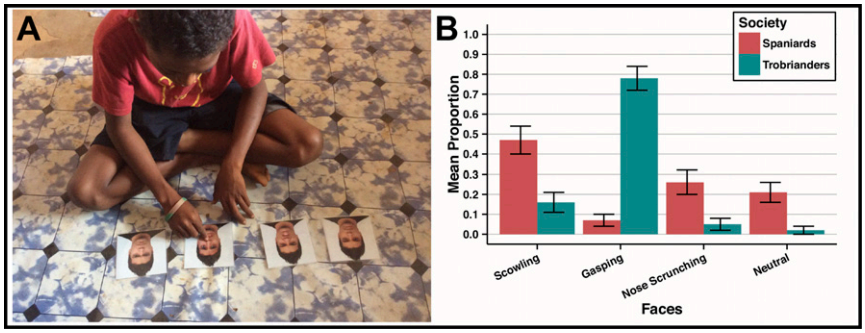

Fig. 3. Study 2's procedure and results. (*A*) A Trobriand participant from Vakuta Island pointing at the threat display. (*B*) Mean proportion of Trobrianders ($n = 58$) and Spaniards ($n = 58$) selecting the threat display. Error bars represent 95% CIs based on SEM.

populations—is a notably powerful attention-grabbing signal. Newborns show a preference for direct eye gaze (48), and adults seem to respond rapidly to exposed sclera, not necessarily because they are decoding fear, but because they are processing relevant and unfamiliar stimuli (40, 49). Interestingly, due to the predominance of high spatial frequencies in the "fear" gasping face conformation (50), the observations of naturally occurring agonistic encounters in small-scale societies have been reported only at close distances. This observation raises the question of how long-distance threats are negotiated.

Trobrianders seem to use acoustic threats over longer distances. *Katugogova*, a high- pitched, undulating scream (also, *katugogola*) (51), is produced in agonistic encounters, and it is interpreted as a threatening vocalization before interclan and intervillage fights. A similar vocalization has been observed during intertribal fights in other small-scale societies of mainland Papua New Guinea (52). *Katugogova* seems to be context-dependent, however, because, although the call is always loud, it can also inform about very positive events. As such, the context in which *katugogova* is heard is necessary to disambiguate its meaning (53).

In sum, Trobrianders, among other small-scale society members, interpret "fear" gasping faces as threat displays, and, as we have shown here, they also interpret them as an intent to aggress. Our findings should lead researchers to reconsider the assumption that a "fear" gasping face is a uniform, pancultural index of fear, and they also suggest the use of alternative behavioral descriptors for the "fear" face. Results with the gasping face and the other facial displays studied here also lead us to conclude that affective science needs to explore new theories on both the production of and response to facial displays.

Materials and Methods

Participants. In study 1, 72 Trobriand adolescents [36 male; mean age (M_{age}) = 12.68 y, SE = 0.20 y; age range: 9–15 y) were recruited in Kaduwaga (n = 22), Kaisiga (n = 31), and Kuyawa (n = 19) villages (Trobriand Islands, Papua New Guinea). Only 32% of them understood and spoke some English words. Thirty-six (18 male; M_{age} = 12.67 y, SE = 0.29 y) were assigned to match an emotion label to a face among an array of six facial expressions whereas the other 36 (18 male; M_{age} = 12.69 y, SE = 0.27 y) matched a social motive label. In study 2, participants were 116 adolescents (60 male; M_{age} = 14.64 y, SE = 0.09 y; age range: 13–17 y) from the Trobriand Islands (n = 58), and Western controls from Spain (n = 58). Trobriand Islands' participants were recruited from the islands of Kaileuna and Vakuta (30 male; M_{age} = 14.62 y, SE = 0.12 y; age range: 13–17 y), with the Western controls recruited in Madrid from the Joyfe School (30 male; M_{age} = 14.66 y, SE = 0.13 y; age range: 13–16 y). Institutional review board (IRB) approval was obtained through the IRB of Universidad Autónoma de Madrid. In the field, authorization and informed consent were obtained by Trobriand Islands' political (i.e., paramount chief and different local chiefs and elders), religious (e.g., Catholic missions), and educational authorities (i.e., primary and elementary schoolmasters), as well as the National Research Institute of Papua New Guinea. For the Western control, authorization was provided by the Head of the Psychological and Educational Office at Joyfe School (Madrid), and informed consent was obtained by all participants' legal tutors.

Setup. To avoid the leaking of information, we conducted the studies' sampling from the population of different geographical locations (islands and villages), without spending more than a day for data collection in any one location. We arranged with the headmasters and schoolteachers a procedure that kept participants unaware of what the previous participants were doing in the testing area. The studies were conducted during class time.

Participants arrived sequentially to an isolated testing area (e.g., the headmaster's office), sitting on the floor while the experimenter introduced himself and conducted a brief interview in Trobrianders' vernacular to establish rapport. The experimenter read the instructions and recorded the responses on a response sheet booklet kept hidden from the participants' view. For all trials, the experimenter repeated aloud participants' responses as a double check. Participants finishing their collaboration were thanked, rewarded with candy, and then returned to their classrooms. Automatically, a different participant left the class toward the testing area, and so on. During this process, participants returning to their respective classrooms remained in silence while teachers were proceeding with their lessons.

Stimuli. In study 1, one female set of six still photographs—five facial expressions held to be prototypical of "emotion" and a neutral face—was selected randomly from the Amsterdam Dynamic Facial Expression Set (54). The facial expressions, coded as the number of cooccurring facial muscle contractions and referred as action units (AU), were F09-joy (smiling; AU6 + AU12 + AU25), F09-sad (pouting; AU1 + AU4 + AU15 + AU17), F09-anger (scowling; AU4 + AU5 + AU7 + AU17 + AU23 + AU24), F09-fear (gasping; AU1 + AU2 + AU4 + AU5 + AU20 + AU25), F09-disgust (nose scrunching; AU9 + AU10 + AU25), and F09- neutral (neutral). In study 2, one male set of four still photographs—three facial expressions held to be prototypical of "emotion" (i.e., anger, fear, and disgust) and a neutral face—was randomly selected from the Radboud Faces Database (55). The facial expressions were Rafd70-angry (scowling; AU4 + AU5 + AU7 + AU17 + AU23 + AU24), Rafd70-fearful (gasping; AU1 + AU2 + AU4 + AU5 + AU20 + AU25), Rafd70-disgusted (nose scrunching; AU9 + AU10 + AU25), and Rafd70-neutral (neutral). All images were formatted with a similar size (average size 7.4 cm × 5.2 cm), color-printed, and laminated.

Data Analysis. Most of the data analyses were performed with R (56) using the functions included on different packages. Confidence intervals were computed with the function *add4ci* of the package "PropCIs" (57, 58), two-sample permutation tests with the package "exactRankTests" (59), Cochran–Mantel–Haenszel tests with the package "coin" (60), and binomial tests with the package "binom" (61).

Procedures. In study 1, participants were supplied a control task aimed at assessing their understanding of the task (refer to *Supporting Information*). In the testing phase, the experimenter randomly assigned participants to the emotion or social motives condition, blocking for gender. Participants chose one facial display to match the label that was presented. Participants completed five trials sequentially, one trial for every category of emotion (e.g., anger) or social motives (e.g., threat), with the order of presentation of labels for emotions and social motives labels randomized for every participant. Participants could select one facial expression among an array of six (i.e., a smiling, pouting, scowling, gasping, nose scrunching, and neutral face), along with a card with a black cross meaning "other face not present in the array"; they could also answer that they did not know the response. The faces displayed on the floor were shuffled randomly for every trial. In study 2, participants had to select—in just one trial—the face predicting an aggressor's physical attack from an array of four facial expressions (i.e., a scowling, gasping, nose scrunching, and neutral faces). The faces displayed on the floor were shuffled randomly for each trial. The experimenter next read the instructions in Kilivila language (Trobrianders) and Spanish (Spaniards): "I want you to see all the pictures of this man. He is going to start a fight and he is going to attack others. Touch with your hand the face of the man that wants to start a fight."

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Supporting Information

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The Trobrianders of Papua New Guinea

Trobrianders belong to one of four matriclans (*kumila*). Matriclans are socially ranked, with chiefly matrilineages possessing a series of hereditary rights in terms of land entitlements, house and personal decorations, and magic formulae and objects, as well as personal privileges. Trobriand chiefs still maintain nominal power, largely dependent upon their charisma, negotiating capacity, and skills.

Chiefly ranked villagers and commoners share similar standards of living. Trobrianders live in small villages and hamlets built with bush materials although new dwelling aggregates consisting of corrugated iron roofing are spreading through the islands. There is no electricity or running water, and there are no sewers. Medical assistance and other government-based services are scant in Kiriwina Island and nonexistent in the rest of the archipelago. Due to the absence of any extractive, industrial, and commercial enterprises, Trobrianders rely on traditional gardening and fishing practices for subsistence (Fig. S1). In Kiriwina Island, overpopulation, as well as the higher mobility of people and goods, has also become a mediator of globalization. All in all, in the present studies, we sampled participants from populations with almost nonexistent contact with anthropologists, Western tourists, and nationals from the Papua New Guinea mainland (i.e., Kaileuna, Kuyawa, and Vakuta islanders).

Participants were students attending primary schools and residing in the islands of Kaileuna (Kaisiga and Kaduwaga villages), Kuyawa (Kuyawa village), Munwata (Munwata village), and Vakuta (Kaulaka, Vakuta, and Okinai villages). Schools in the Trobriand Islands lack teachers and infrastructure, with deficient classrooms and other basic facilities. Kilivila, the Trobrianders' vernacular, is the Austronesian language spoken in the archipelago (24). It is an oral language although elementary schoolchildren are taught how to spell, read, and write Kilivila through literal and phonetic transcriptions, rendered with the Latin alphabet. In contrast, English alphabetization attempts have resulted in a slow switch from oral to written Kilivila. Despite many Trobrianders' acquaintance with English, Kilivila is spoken with total exclusivity in the islands. As a result, most elements of Trobriand cultural heritage (e.g., myths, rituals, material and immaterial culture, gardening, fishing and construction techniques, traditional healing methods, sorcery and witchcraft, dances, and woodcarving) remain in place as of 2016.

The Descriptive Phase in the Field

The third coauthor (S.J.) spent a total of 21 mo in the Trobriand Islands, obtaining a deep knowledge of the vernacular, absorbing Trobriand sociocultural practices and values, and creating a valuable network of informants and collaborators in Kiriwina, Kaileuna, Kitava, Vakuta, and Tuma Islands. His Trobriand adopted family and primary field site are located in Yalumgwa (Kiriwina Island). The first coauthor (C.C.) spent 7 mo in the Trobriand Islands, creating a network of informants and collaborators in Kiriwina, Kaileuna, Vakuta, Kuyawa, and Munwata islands. His adopted family and primary field site are located in Kaisiga (Kaileuna Island).

Relying on our knowledge of the vernacular, participant observation, and the rapport built with the host community, we conducted in the Trobriand Islands an extensive exploratory and descriptive phase. Among many other goals, this first stage was aimed at mapping English emotion concepts onto Kilivila concepts as well as the best suitable translations to generate the emotions' and the social motives' labels. Additionally, we relied on an ethnographic database of Trobrianders' emotion concepts generated in several islands of the archipelago with the help of our network of informants and collaborators.

Study 1

Labels. In the emotion condition, the labels used to match facial expressions were *mwasawa* (happiness), *ninamwau* (sadness), *leya* (anger), *kokola* (fear), *minena* (disgust), and *kalamolu* (she is hungry) as a control. In the social motives condition, the labels were based on previous work on facial expressions and behavioral ecology (14, 17). Thus, response options were *bwena kwayai, ambese bukula?* (good afternoon, where are you going?) for social invitation; *kupilasegu igau*, *kuyamategu* (help me, take care of me) for seeking help and protection; *kweita, bawen* (back off or I will attack you) for threat; *gala bukuwegu*, *apeki yowai* (don't hurt me, I don't want to fight) for submission; *sena bogina* (that stinks) for rejection; and *bala bakam* (I am going to eat) as a control.

Control Check. Before the testing phase, the experimenter conducted one control check aimed at assessing that eligible participants correctly understood the matching task. The experimenter showed sequentially the pictures of four local animals (i.e., a dog, a pig, a fish, and a rooster) and asked the participant to select one descriptor from a list. For every trial, the experimenter read four possible response options (three animals and the option "other"). Participants were instructed to select the option "other" (*itwari*) in case the available response options did not match the animal previously shown. In one of the four trials, the correct response option was "other." The order of presentation of the pictures was randomized for every participant whereas response options' order of presentation was randomized for each trial. All participants successfully matched all animals to their corresponding labels, including matching the absent animal to the picture representing "not present in the array."

Procedure. For the emotion condition, the experimenter next read the instructions in Kilivila language: "Now, you have to do the same we have done with the animal cards, but with the faces of a girl. Remember, if you don't see the picture in the array of faces, select this card instead (the experimenter pointed to the card with a cross). Imagine you see this girl feeling *X* [e.g., sadness]. Touch with your hand where is the face displaying *X*." For the social motives condition, the instructions were the same as before except for the following: "Imagine that you see this girl telling you *X* (e.g., back off or I will attack you), touch with your hand the face she will display."

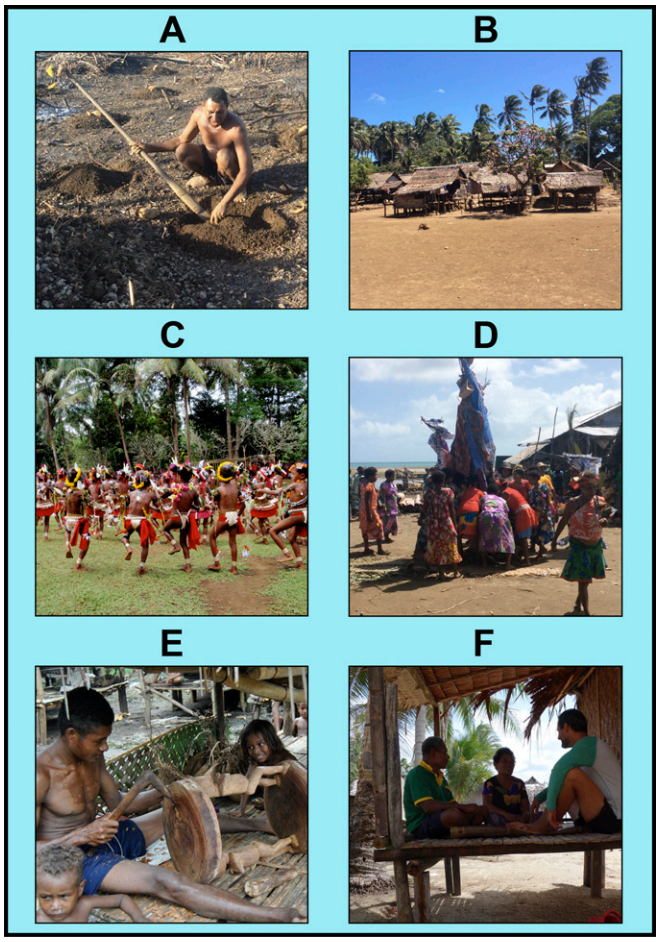

Fig. S1. Daily life scenes and customs in the Trobriand Islands. (*A*) An elder from Bulakwa village (Kaileuna Island) showing how to till the soil before planting yams (*sopu*). (*B*) Traditional huts in Kaulaka village (Vakuta Island). (*C*) Pupils performing traditional dances (*keywosi*) as part of school activities (Kiriwina Island). (*D*) Distribution of goods (*sagali*) in Kaduwaga (Kaileuna Island) a year after the funeral of Kaileuna's paramount chief. (*E*) Traditional table carving in Bwetalu village (Kiriwina Island). (*F*) The first coauthor (C.C.) on his hut's veranda (*kaukweda*) in Kapisila village (Kaileuna Island) during an interview with the director of Kaisiga elementary school—Moses Moyobova—and his wife.

Table S1. Proportion of Trobrianders matching a facial expression to an emotion or social motive label

	Facial expression								
Labels	Smiling	Pouting	Scowling	Gasping	Nose scrunching	Neutral	Other	χ^2	*P*
Emotions ($n = 36$)									
Happiness	1*	0.00	0.00	0.00	0.00	0.00	0.00	216.00	< 0.001
Sadness	0.03	0.53*	0.08	0.06	0.22	0.08	0.00	51.11	< 0.001
Anger	0.00	0.14	0.06	0.56*	0.19	0.06	0.00	57.72	< 0.001
Fear	0.00	0.25	0.03	0.39*	0.28*	0.03	0.03	37.89	< 0.001
Disgust	0.00	0.11	0.36*	0.28*	0.22	0.00	0.03	32.06	< 0.001
Control (hunger)	0.00	0.31*	0.14	0.08	0.11	0.28*	0.08	18.44	< 0.01
Social motives ($n = 36$)									
Social invitation	0.67*	0.06	0.00	0.00	0.00	0.28*	0.00	96.22	< 0.001
Help, protection	0.14	0.17	0.19	0.00	0.08	0.42*	0.00	30.89	< 0.001
Threat	0.00	0.14	0.06	0.69*	0.08	0.00	0.03	93.11	< 0.001
Submission	0.19	0.25	0.14	0.11	0.11	0.17	0.03	7.56	0.290
Rejection	0.00	0.14	0.22	0.06	0.56*	0.03	0.00	60.06	< 0.001
Control (to eat)	0.14	0.06	0.19	0.03	0.06	0.44*	0.08	31.67	< 0.001

Proportions are rounded up. To obtain *P* values, χ^2 goodness-of-fit tests were computed on rows by bootstrapping 10,000 replicates for simulation.

*Standardized residuals higher than 2 SD.

Table S2. Proportion of Trobrianders who matched the predicted expression to its corresponding emotion and social motive label

	Predictions				
Facial expression	Emotion	Social motives	P(1) − P(2)	*P*	95% CI
Smiling	1	0.67	0.33	<0.001	(0.17, 0.48)
Pouting	0.53	0.17	0.36	0.003	(0.15, 0.57)
Scowling	0.06	0.06	0.00	0.999	(−0.12, 0.11)
Gasping	0.39	0.11	0.28	0.013	(0.07, 0.47)
Nose scrunching	0.22	0.56	−0.34	0.007	(−0.56, −0.12)

Proportions are rounded up. P(1) − P(2) = the difference of matching scores' proportions between Western predicted attributions of emotion and social motives. *P* values and 95% confidence intervals (CIs) for the difference of matching scores' proportions between attributions of emotion and social motives were computed through two-sample permutation tests. The distribution under the null hypothesis was computed from all possible permutations.

Table S3. Logistic regression model including society and gender as predictors for selection of "fear" gasping faces

			95% CI for odds ratio		
Predictors	B	(SE)	Lower	OR	Upper
Constant	−7.25	1.46			
Society	3.89*	0.62	14.59	48.70	162.54
Gender	0.49	0.55	0.56	1.62	4.74

Substantive significance for modeling the selection of gasping faces: $R^2 = 0.60$ (Nagelkerke), model (G^2) χ^2 (2) = 67.97, $P < 0.001$. *$P < 0.001$. B, regression coefficient; OR, odds ratio.

Table S4. Logistic regression model including society and gender as predictors for selection of "angry" scowling faces

			95% CI for odds ratio		
Predictors	B	(SE)	Lower	OR	Upper
Constant	−2.56	0.97			
Society	1.57*	0.45	1.99	4.83	11.69
Gender	−0.48	0.43	0.27	0.62	1.44

Substantive significance for modeling the selection of gasping faces: $R^2 = 0.17$ (Nagelkerke), model (G^2) χ^2 (2) = 14.75, $P < 0.001$. *$P < 0.001$.